Seasonal Variation in *Tachysphex terminatus* (Smith) (Hymenoptera: Sphecidae, Larrinae)

Nancy B. Elliott, Frank E. Kurczewski
Department of Entomology, State University of New York
College of Environmental Science and Forestry, Syracuse, New York 13210

Received for Publication March 11, 1974

Abstract: Comparisons of morphological characters between successive generations of males and females of *Tachysphex terminatus* (Smith) in upstate New York were made. Significant differences were found for the samples of females but not for those of males. However, the males showed greater variability within a generation than did the females.

Introduction

Tachysphex terminatus (Smith), a common North American digger wasp, is bivoltine in the Northeast with generations emerging in June and August. As part of a study of morphological variation in the species throughout its range (Elliott, 1971), it was deemed desirable to determine whether there was significant morphological variation between individuals of successive generations.

Materials and Methods

Samples of males and females were collected near Chittenango, New York, in June and August, 1969. The following size-related characters were measured for each specimen: head width, interocular distance across vertex, clypeal width, forewing vein length along costal margin of the wing to the distal end of the marginal cell, and length of flagellomere 2. We tested for seasonal differences in these characters by using an F test for comparing two means.

Results and Discussion

Results of comparisons for each sex are given in Table 1. Of the characters measured, only the length of flagellomere 2 showed significant differences between samples of males. Comparisons of the same characters in females demonstrated differences in interocular distance, clypeal width, forewing vein length, and length of flagellomere 2. This analysis did not show a significant difference for head width between samples of females. However, a one-way analysis of variance comparing several samples of females from various U.S. localities revealed significant differences for this character for June and August samples from Chittenango.

Acknowledgments: We thank G. C. Gaumer, Department of Entomology, Texas A. & M. University, for collecting many of the specimens used in this study.

Table 1. Seasonal Variation in Morphological Characters of *Tachysphex terminatus*

Character	♂♂	♀♀
Head width	M. S. Groups = 21.13	M. S. Groups = 31.04
	M. S. Ind. = 18.16	M. S. Ind. = 8.70
	F = 1.16	F = 3.56
Interocular	M. S. Groups = 0.94	M. S. Groups = 9.04
Distance	M. S. Ind. = 1.91	M. S. Ind. = 0.30
	F = 0.49	F = 6.93*
Clypeal width	M. S. Groups = 4.23	M. S. Groups = 14.08
	M. S. Ind. = 5.29	M. S. Ind. = 3.20
	F = 0.80	F = 4.40*
Forewing	M. S. Groups = 75.72	M. S. Groups = 190.48
Vein length	M. S. Ind. = 19.58	M. S. Ind. = 14.39
	F = 3.87	F = 13.24*
Flagellomere 2	M. S. Groups = 4.16	M. S. Groups = 6.05
	M. S. Ind. = 0.39	M. S. Ind. = 0.72
	F = 10.67*	F = 8.40*

* = significant at $\alpha = 0.05$.

The fact that females showed greater morphological variation between generations than males leads one to ask whether or not females really are more variable. Lewontin (1966) suggested comparing relative variability of two samples by comparing variances of the logarithms of the measurements using F. Table 2 shows comparisons of this kind for our samples. Only in the case of forewing vein length for the June samples did females show greater variability than males. Conversely, males from the August sample were more variable than females in every character compared. A similar comparison for a sample from Lakin, Kansas, also showed more morphological variability among the males (Elliott, 1971). Eickwort (1969) compared variability of males and females of *Polistes exclamans* Viereck (Vespidae) and found the males to be more variable,

Table 2. Relative Variability of Morphological Characters in Males and Females of *Tachysphex terminatus*

	Head Width	F. V. L.	Femur 1
June, 1968			
S^2 log ♀	0.00267	0.00713	0.001
S^2 log ♂	0.00130	0.00291	0.00175
F	2.054	2.45*	1.75
August, 1968			
S^2 log ♀	0.0004	0.0002	0.000533
S^2 log ♂	0.00141	0.00264	0.00438
F	3.500*	13.00*	8.218*

* = significant at $\alpha = 0.05$.

as expected, because they are haploid. She conceded that reports of other male Hymenoptera which are less variable than conspecific females might reflect decreased responsiveness to environmental selective pressures. In such species, the females are involved in food gathering and nesting while the primary function of the males is copulation.

Females of *T. terminatus* are continually subjected to the selective pressures of the environment, especially during nesting, hunting, and prey transport. Apparently selective pressures act upon them, resulting in greater seasonal variation than in males. The males, on the other hand, perhaps because they are haploid, show greater intrapopulational variation.

In *T. terminatus* females, August samples had larger mean values for size-related characters than June samples. Kurczewski (1964) observed that females of this species stored not only more prey per cell in June than in August but also a greater biomass; hence the individuals emerging in August have been reared on more food than those emerging in June, probably accounting for their larger size. Dow (1942) reported that larger cocoons of the cicada-killer were found in cells stocked with two cicadas and smaller cocoons in cells stocked with only one.

Literature Cited

Dow, R. 1942. The relation of the prey of *Sphecius speciosus* to the size and sex of the adult wasp. Ann. Entomol. Soc. Amer., **35**: 310–317.

Eickwort, K. R. 1969. Differential variation of males and females in *Polistes exclamans*. Evolution, **23**: 391–405.

Elliott, N. B. 1971. Morphological variation in *Tachysphex terminatus* (Smith) and *Tachysphex similis* Rohwer (Hymenoptera: Sphecidae, Larrinae). Syracuse, N.Y., S. U. N. Y. College of Environmental Science and Forestry. Ph.D. thesis.

Kurczewski, F. E. 1964. A comparative ethological study of some Nearctic digger wasps of the genus *Tachysphex* Kohl. (Hymenoptera: Sphecidae, Larrinae). Ithaca, N.Y., Cornell Univ. Ph.D. thesis.

Lewontin, R. C. 1966. On the measurement of relative variability. Syst. Zool., **15**: 141–142.